

**REMARKS**

The office action issued by the Examiner and the citations referred to in the office action have been carefully considered.

**Specification**

With regard to the Abstract, Applicant calls attention to the Amendments in the Specification, filed as a Preliminary Amendment on October 10, 2006, the filing date of the application. As a subsequent filing on the same day, another copy of the WIPO publication of PCT/US2005/012458 appears as a Specification within the file wrapper. This version appears to effectively override the Preliminary Amendment. It should be noted that the second copy of the WIPO publication was not presented as a Substitute Specification, nor was it labeled as such. Thus, the apparent result of overriding the Preliminary Amendment was unintended.

Accordingly, the request to add the provided Abstract made in the Preliminary Amendment is being presented again, in the event that the second copy of the WIPO publication had the effect of negating the first request. Likewise, the claim for priority in the Preliminary Amendment is presented herein. Inasmuch as this matter was presented in the Preliminary Amendment on the filing date, no new matter is added by its presentation here. If this remains deficient for any reason, the Examiner is invited to call the undersigned agent for further discussion.

Other errors that may have arisen from the second copy of the WIPO publication may need to be addressed prior to allowance of the present application. A telephonic conference is hereby requested prior to mailing of a Notice of Allowance to address such issues.

**Rejections under 35 U.S.C. §102**

Claims 15-20, 24 and 26-28 were rejected under 35 U.S.C. 102(b) as being anticipated by Clawson et al. (US 6,083,425). Claim 15 has been amended to include limitations from claims 16 and 18, each of which are now cancelled.

*Claim 15*

The Office Action states: “With respect to claim 18, Clawson teaches wherein said plurality of steam reformation catalysts includes at least two of a high-activity steam reformation catalyst (66), a coke-resistant steam reformation catalyst (28) and a steam reformation catalyst which promotes a water-gas shift reaction (84) (col. 6, lines 14-45) (as illustrated).”

The “high temperature shift catalyst 66” of Clawson cannot be considered a high-activity steam reformation catalyst. The disclosure of Clawson states:

The heated reformat stream exits the second vessel outlet 62 to the flow distribution zone 63, where it has been cooled to a temperature of between about 300° C. and about 600° C. and is directed through the perforated plate 68 to the high temperature shift zone 64 where essentially all of the carbon monoxide is removed or reduced by contacting the heated reformat stream with the high temperature shift catalyst 66 at a temperature in the range of between about 300° C. and 600° C. [Clawson, col. 6, lines 31-39].

As would be recognized by those having ordinary skill in the art, the catalyst of Clawson is used in one stage of a water-gas shift reaction, in which carbon monoxide reacts with water vapor to form carbon dioxide and hydrogen. This is in contrast to a steam reformation process, in which hydrocarbons react with water vapor to form carbon monoxide and hydrogen. Indeed, one or more products of steam reformation (i.e., carbon monoxide) may be the reactants of a water-gas shift reaction. The water gas shift reaction (equation 3 of the present specification) is distinctly different from steam reformation (equation 1 of the present specification).

Clawson clearly delineates between the two distinct processes. One having ordinary skill in the art not have interpreted the high temperature shift catalyst 66 of Clawson to include a high-activity steam reformation catalyst.

Because *Clawson* fails to teach or suggest both a high-activity steam reformation catalyst and a coke-resistant steam reformation catalyst, it is respectfully submitted that *Clawson* fails to teach each and every element of claim 18. As such, it is respectfully submitted that claim 18 and its respective dependent claims are not anticipated by the teachings of *Clawson*, and reconsideration is respectfully requested.

The present disclosure states: “The second catalyst is a coke-resistant steam reformation catalyst. Preferred coke-resistant catalysts include supported, doped, nickel-based catalysts. Representative dopants include calcium oxide, potassium oxide, calcium aluminate and combinations thereof.”

With regard to the “steam reforming catalyst 28” of Clawson, no mention of coke-resistance is made. The disclosure of Clawson does not disclose a catalyst having coke resistant characteristics.

Based on the above remarks, Claim 18 is not anticipated by Clawson. Clawson’s catalyst 28 is a steam reformation catalyst (not a coke-resistant steam reformation catalyst as indicated by the examiner), 66 is a high temperature water gas shift catalyst (not a high activity steam reformation catalyst) and 84 is a low temperature water gas shift catalyst (not a steam reformation catalyst that promotes a water gas shift reaction).

As such, Clawson does not teach or suggest or distinguish between the definitive characteristics of a plurality of steam reforming catalysts. In particular, the characteristics of high activity steam reforming catalysts, coke resistance steam reforming catalysts and water gas

promoting steam reforming catalysts are not taught. As these distinctions are not taught, it cannot be said that Clawson satisfies the limitations drawn to such distinctions.

Additionally, the features of operation of the device of Clawson are in tension with the device claimed as disclosed in the supporting Specification.

Clawson teaches that the low temperature water gas shift reaction is conducted between 150-300 C (Clawson, column 6, line 50-55), which is significantly lower than described in our specification (see Example 1 for instance).

Clawson also teaches the use of an oxygen containing gas (Clawson, abstract) and as a result, catalyst 28 is supported within the partial oxidation zone 24 (Clawson, column 4, line 10). The use of oxygen in the feed stream to the reaction chamber and hydrogen generation via partial oxidation or autothermal reforming is not described or claimed in the present application.

Furthermore, Clawson does not teach a staged configuration wherein the stages are located in a single reaction chamber. Clawson's reformer vessel contains a plurality of reformer vessels (Clawson, column 3, lines 44-57). Catalyst 28 is located in the first vessel 18 (Clawson, Figure 1). It should be noted that Clawson's catalyst 66 and 84 are located in a high temperature shift zone and a low temperature shift zone respectively and are physically removed from the first vessel 18 and catalyst 28. Amended claim 15 which recites a hydrogen reaction chamber, a single vessel in which is disposed a plurality of steam reformation catalyst is therefore not anticipated by Clawson. In fact Clawson is silent with respect to the use of a steam reformation catalysts of different compositions and characteristics in a staged fashion inside a single reaction chamber. It would not have been obvious to modify the device of Clawson to satisfy these limitations, as doing so would defeat the intentional separation of components of Clawson into a high temperature shift zone and a low temperature shift zone.

It is noted that in order to overcome an anticipation rejection, it must only be demonstrated that the references cited fail to teach each and every claim limitation. *See Verdegaaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). Because *Clawson* fails to teach or suggest the claimed plurality of steam reformation catalysts in the claimed configuration, it is respectfully submitted that *Clawson* fails to teach each and every element of claim 15. As such, it is respectfully submitted that claim 15 and its respective dependent claims are not anticipated by the teachings of *Clawson*, and reconsideration is respectfully requested.

#### *Claim 19*

The Office Action states: “With respect to claim 19, *Clawson* teaches wherein said high-activity steam reformation catalyst (66) is a supported nickel-based catalyst/(transition metal oxides supported on a perforated plate (70)) (col. 4, lines 32-58).”

“Preferably the high temperature shift catalyst 66 includes transition metal oxides, such as ferric oxide ( $\text{Fe}_2\text{O}_3$ ) and chromic oxide ( $\text{Cr}_2\text{O}_3$ ). Other types of high temperature shift catalysts include iron oxide and chromium oxide promoted with copper, iron silicide, supported platinum, supported palladium, and other supported platinum group metals, singly and in combination.” [*Clawson*, col. 4, lines 48-54].

*Clawson* does not specify nickel as a candidate. While nickel may be considered a transition metal, one having ordinary skill in the art could not have been expected to readily separate nickel from among the laundry list of over 60+ elements that are within the broad group of “transition metals.” This is particularly true where *Clawson* calls out particular metal oxides and omits nickel with respect to its high temperature shift catalyst 66. In contrast, *Clawson* does recite nickel with respect to its steam reforming catalyst 28, further emphasizing the distinction between catalysts for steam reformation and catalysts for water-gas shift reactions.

Because *Clawson* fails to teach or suggest a high-activity steam reformation catalyst of a supported nickel-based catalyst, it is respectfully submitted that *Clawson* fails to teach each and

every element of claim 19. As such, it is respectfully submitted that claim 19 and its respective dependent claims are not anticipated by the teachings of *Clawson*, and reconsideration is respectfully requested.

Thus, each of claims 15, 17, 19-20, 24 and 26-28 are believed to be patentable and in an allowable state. Reconsideration is kindly requested.

### **Rejections under 35 U.S.C. §103**

Claims 21-23 were rejected under 35 U.S.C. 103(a) as obvious over *Clawson et al.* (US 6,083,425), as applied to claim 20 above, and further in view of *Lomax, JR. et al.* (US 2002/0146359).

It would be incumbent upon *Lomax* to remedy the deficiencies of *Clawson* with respect to the pending claims, as discussed above. However, Applicant respectfully submits that *Lomax* does not satisfy the limitations discussed above. Accordingly, as claims 21-23 depend from claim 20, Applicant respectfully submits that claims 21-23 are patentable for at least the same reasons presented above with respect to claim 20. Reconsideration is kindly requested.

Claim 25 was rejected under 35 U.S.C. 103(a) as obvious over *Clawson et al.* (US 6,083,425), as applied to claim 19 above, and further in view of *Korotkikh et al.* (US 2003/0064887)

It would be incumbent upon *Korotkikh* to remedy the deficiencies of *Clawson* with respect to the pending claims, as discussed above. However, Applicant respectfully submits that *Lomax* does not satisfy the limitations discussed above. Accordingly, as claim 25 depends from claim 15, Applicant respectfully submits that claim 25 is patentable for at least the same reasons presented above with respect to claim 15. Reconsideration is kindly requested.

It is respectfully submitted that all of the Examiner's objections have been successfully traversed and that the application is now in order for allowance. Accordingly, reconsideration of the application and allowance thereof is courteously solicited.

The Director is authorized to charge any additional fee(s) or any underpayment of fee(s), or to credit any overpayments to **Deposit Account Number 50-2298**. Please ensure that Attorney Docket Number 37929-32102 is referred to when charging any payments or credits for this case.

Respectfully submitted,

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